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PATENT ABSTRACTS OF JAPAN

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(21)Application number : 05-104555 (71)Applicant : CENTRAL GLASS CO LTD

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(54) ULTRAVIOLET-ABSORBING AND HEAT-INSULATING GLASS

(57)Abstract:

PURPOSE: To provide a glass with the durability, wear resistance, etc., remarkably improved by laminating a multilayer film including a noble-metal thin film on the surface of a transparent glass substrate and then applying a silicone hard coat through a primer coat contg. a fluorescent brightener and a UV absorbent.

CONSTITUTION: A multilayer film including at least one layer of a noble-metal thin film is laminated on the surface of a transparent glass substrate, and then a synthetic-resin primer soln. contraction dissolved flurescent brightener and UV absorbent is applied, heated and cured. A silicone hard coat soln. obtained by dissolving a siloxane prepolymer in org. solvent is then applied, heated and cured he process is repeated, and a UV-absorbing and heat-insulating glass is obtained. This glass having a relatively high visible light transmittance and capable of sufficiently securing a visible field is used as the window, transparent heating element, electromagnetic wave shielding body, etc., for the building and vehicle with the comfortableness remarkably improved.

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Subsequently, ultraviolet absorption heat insulating glass which covers with applying and carrying in 1)Lamination membrans formation of the multileyer film which contains one or more layers of cicus-metais system thin films at least on the surface of a transparent glass substrate is cerried sim(s)]

heat cura of the silicone series hard court selution made to dissolve a siloxane prepolymer in an containing one or more layers of said precious-metals system thin film is characterized by being anic solvent after applying and carrying out heat cure of the synthetic resin system primer liquid ain 2]The ultraviolet absorption heat insulating glass according to claim 1 with which a multilayer on carried out dissolution addition of a fluorescent brightener and the ultraviolet ray absorbent by one, and is characterized by things.

aim 3]Claim 1, wherein said precious-metals system thin film is Ag, Au, Ou, Pt, or its alloy system, electric, a precious-metals system or the elloy system and a metal system, sequential lamination itm 4]The ultraviolet absorption heat areulating glass according to claim 2, wherein dielectrics of dielectric, or 3 thru/or 7 layer membranes that change in the repetition lamination. ultraviolet absorption heat insulating glass given in 2

ansiation done.]

sim 5]The ultraviolet absorption heat insulating glass according to claim 1, wherein said synthetic

in system primer liquid is an scryilo solution containing a silicone component.

I multilayer film are Si, Ti. Sn, alaminum, Or. SUS. Ta, Zn, In, SiC and an oxide of these alloys, a

ide, and a nitrogen-oxides film.

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ALED DESCRIPTION

tailed Description of the Invention]

act solar radiation and which is mainly used for windowpanes, such as vehicles, such as a car, and uliding. Since it has uttraviolet-rays shielding performence with easing with £ of direct sunlight } and being able to make amenity knoreve, it is related with the useful ultraviolet absorption heat dustrial Application] This invention is hear ray shielding glass with a tunic which covers a solar slating glass which can prevent degradation by the ultraviolet rays of an interior material

posed as an article which intercepts solar energy, has the high transmissivity of a visible range as acription of the Prior Art The composition of a dielectric / silver / dielectric is conventionally heat reflective glass used in order to mainly reduce cooling load, and low radiate glass which as hosting efficiency, and has high reflection in an infrared region. For example, at JP,63-3043.A. not less than 60% of infrared reflecting object article is proposed for visible light.

namissivity by ZnO /Ag/ZnO /Ag/ZnO from the substrate, At JP.2-111844A, the heat insulation 03) For example, as a method of covering uitraviolet rays, the method of coating with 2nO is amon to a substrate, and the ultraviolet absorption board which mixed the ultraviolet ray insted glass of the neutral color tone is proposed by ITO /Ag/ITO /Ag/ITO. orbent to the substrate is also proposed.

prosocpic surface moisture and stopping fully demonstrating shielding performance, it was required ilding effect over ultraviolet rays was not enough, for giving an ultraviolet-rays shielding effect. it matically effective, but, Since achesion strongth fell white a silver system film deteriorates easily oblam(s) to be Solved by the invention/Since the heat ray shelter article and infrared reflecting ect article containing a silver aystem film which was mentioned above reflect solar enorgy and recially to moisture and hygroscopic surface moisture, and silver condenses with moisture and se unable to use it as a single plate but to process to doubling or a double layer. Since the lant energy, in respect of cooling load reduction and space heating load reduction, it is ded to be used as the glass laminate.

od by a single plate on this substrate. Furthermore, these days, the influence of the ultraviolet rays USIFor giving this in an ultraviolet absorption board since there is no offeet of heat ray reflection infrared reflection, it is necessary to laminate the above-numbioned reflection film, and cannot be ozone layer depletion is becoming important with effective use of solar energy, and, in addition to solar control which is effective use of the conventional solar energy also from this point. aviolet-rays cover is important.

169Wille the above-mentioned silver system multilayor film composition maintains high visitibe light ramisaivity as solar control, since a heat, ray and infrared reflection performance are high, are used turstice was not obtained even if it laminates the protective film of remarkable thickness, Handling y / that humidity, and moisture need to be meenged / which needs to be as short as possible / ict. 3 was difficult for the until it cannot use it as a shigh sphere from a point of adhesion, but it it process to doubling or a clouble layer and it performs these moreosassings from a durable point. nsparent lieating element, and electromagnetic wave cover etc., but. Since a silver system film indartly at object for construction, heat-insulating-glass [for vehicles], low ratation glass. eriorated remarkably with moisture, such as bumidity, there was a problem that sufficient

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(0007].Although a 2nO film is common as an ultraviolet-rays screen and commerciestration is made. since endurance [especially as opposed to / since orientation is carried out pillar-shaped and it is shielding performance is raised, the place used is limited remarkably. For this reason, by the object or vehicles, the problem that it could not be used unless it processes to doubling or a double layer very easy to ionize / medicine] is remarkable and a ZnO film's is weak when ultraviolet-rays was in the atructural row. Means for Solving the Problem[This invention is made in view of such a point, and Sufficient heat ray shielding performance, For example, it has ultraviolet-rays shielding performance in a layered product which uses at least a precious-matals system thin film which has infrared reflection performance, for which contains a precious—metals system thin film at least, it can fully be used as a single plate. And resistance, etc. which are the above-mentioned problems, is obtained. Though it is a multiplayer film composition was not obtained is provided with ultraviolet absorption heat insulating glass with high a structural row which can raveal enough [being simultaneous end] a function of ultraviolat-rays lamination combination ******. Since remarkable improvement, such as fow endurance, abrasion sover, heat ray cover, and infrared reflection in which performance sufficient with just each oxample, a silver system film, skillfully ecrylic resin and allicence series hard coating resin by enchirance by a useful single plats for vehicles

with applying and carrying out host care of the silicone series hard court solution made to dissolve a 00063Namesy, this invention carries out lamination membranc formation of the multilayer film which siloxana prepolymer in an organic solvent after applying and carrying out heat cure of the synthetic transparent glass substrate, Subsequently, ultraviolet absorption frest insulating glass which covers resin system prener figuld which carried out dissolution addition of a fluorescent brightener and the 9810] And ultraviolet absorption heat insulating glass with which a multilayer film containing one or contains one or more layers of precious-metals system thin films at least on the surface of a ultraviolet ray absorbent one by one, and is characterized by things.

was mentioned above is provided. Having made heat ray cover and infrared reflection into a multilayer system primer liquid being an acrylic achtion containing a siscone component further again and which precious-motals system or the alloy system and s metal system, sequential laminetion of a delectric system thin film is Ag, Au. Cu, Pt, or its alloy system. Ultraviolet absorption heat insulating glass montioned above, wherein dielectrics of said multilayer film are Si. Ti. Sn., aluminum. Cr, SUS, Ta, Zr, or 3 thru/or 7 tayer membranes that change in the repetition lamination and which was merdioned layered product of a dioloctric / silver system alloy film / dielectric here, For example, visible light above. Utraviolet absorption heat insulating gass mentioned above, wherein said presious-metals ransparent substrate, and it is because heat ray cover with it and an infrared reflecting film are 001 (Elltraviolet absorption heat insulating glass which is characterized by said synthetic resin transmissivity is high by laminating five layer systems of ETO / silver / ETO / silver / ETO to a more layers of said precious-matals system thin film is characterized by being a dielectric, a n, SiC and an oxide of these alloys. a nitride, and a nitrogen-oxides film.

transparency and is excellent also in endurance, for example, it is good, but the characteristic is If it is infrared reflection, since a tin exide film by spray method or a CVD method else has high inferior compared with the above-mentioned saver system. and I heat

bbtaineo from near-infrared rays. [remarkable reflectance of an infrared region of long wavelength

for example, it is because it is what is hard to be referred to as a ZnO film which is amplinteric oxide 10012]Atthough there are titanium offride etc. which are the usual solar control films in some which stopped visible fight transmissivity low, that characteristic is low compared with a silver system, and in order for a silver system layered product to be this purpose, it excels most it is considered as an ondurance of a precious-metals system multilayer film, such as the above-mentioned silver system. substantish, it was presupposed by doing in this way that it carries out by applying a silicon system acrylic primer coating illm which dissolved a fluorescent brightener and an utraviolet ray absorbent as an ultraviolet-rays screen and which mainly contains a silicone component, in order that the especially moisture resistence, chemical resistance, and abrasion resistance matit insprove hard court to this.

I case where this uitraviolet-rays screen is laminated with a ZnO film by methods, such as weld

g and vecsum evaporation,

13}Furthermore at this invention, it is the refractive index 2.0 from a transparent substrate

ferably. About 40 mm of transparent dielectrics of a grade, it is the refractive index 2.0 from about is, and refractive-index 2.0. About 40 rm of transparent dielectrics of a grade, About 10-15 nm of ar control is comparatively low and Sun Belt Low -E which reduces cooling load is mainly provided warm places, in this case, correspondence with multiple glass of the abovo-mentioned dielectric / nsmittance, emissivity of 0.15 less than, and 10% or less of transmissivity of 370 nm are desirable. bing bad by a method of covering the whole solar energy with visible light transmissivity is which nn of transparent dielectrics or a transparent substrate about about 10-15 nm of aliver system nponent which carried out discussion addition of a fluorescent brightener and the ultraviolet ray corbent, and to carry out silicon system hard costing further, Thickness constitution of this level they are not less than 70% of visible light transmissivity, 55% or less of solar transmittance, and er system films, and refractive index 2.0 About 70-80 nm of transparent dissectrics of a grade. reparent dielectrics of a grade. That we decided to cost an scryllo primer containing a silicone namissivity is the conditions which become the highest. And in order to be because heat ray heat ray cover and infrared reflection. As a result of using thin like interference, visible fight issivity 0.1 mare preferably. It is § the following and § 370 nm in 5% or less of transmissivity, 14)Furthermore, these days, although comparatively high transmissivity is given to reducing ier, infrared reflection, and ultraviolet-rays cover become enough and to fully satisfy each out 10~15 nm of silver system films, and refractive index 2.0 it covers to about 400 nm of siding performance. Not less than 65% of visible light transmissivity, 60% or less of solar

15]Next, as a substrate, as long as quality of organicity of minerals is also transparent, of sourse, ntioned glass with ultraviolet-rays cover by a single plate is large, and this invention serves as a remphasized that it can be used as various sheet glass products, such as multiple glass or y may be good and colorlessness or coloring may be sufficient as them. It cannot be y effective means to these.

er aystem is made, and shielding performance of ultraviolst rays is comparatively low. Especially

h a warm background, a request to ultraviolet-rays cover is high, a demand on the above-

forming the primer cost which carried out dissolution addition of a fluorescent brightener and the nction? As mentioned above the offraviolet absorption heat insulating glass of this invention, By aviolet ray absorbent to the lamination formed body which comprises the dielectric etc. which mated glass, from the first that it can be used by a single plate.

elding function and an ensurance protective film function by ecrylic coating and the silloen system tem hard court to it as a protective film further, By the lamination formed body which comprises dielectric etc. which contain one or more layers of precious-metals system thin filters at least, a t ray reflex function. Those both that reveal an infrared reflex function and reveal an ultraviolet nbining skillfully. KATSUTO [it has endurance sufficient by a single plate, and / aspecially / the contion heat incubating glass, is excellent in humidity-proof nature, abrasion resistance, chemical ical property, visible light transmissivity is comparatively high, and view reservation can fully be istance, etc., and can be used by a single plate as an object for the exterior without spaiking an their one or more layers of precious-metals system thin films at least, and performing a silicon andary of ultraviolet / visible both fields] very sharply etc., it is what satisfies ultraviolet-rays formed and provides the useful ultraviolet absorption heat insulating glass which boils amenity d court containing the silicone component of the ultraviolet ray absorbent dissolution by or, heat ray cover, and an infrared reliex function, considers it as transpurent ultrayielet kedly and makes it improve as a window for construction or for vehicles.

mple 1 size abbreviation 300mm x300mm and a float glass (floor line3) about 3 mm thick Neutral ample Hereafter, an example explains this invention concretely. However, this invention is not ted to the starting example.

ergent. It sets so that the target of the zane and aliver which have been set in the yacaum

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JP,06-316443,A [DETAILED DESCRIPTION]

should just be in the range of zero to 50,50, in this vacuum chamber --- a degree of vacuum --- about said zinc, and the ZhOx thin film of about 40-rm thickness was formed as the 1st layer by conveying said sheet glass for the inside of DC magnetron reactive sputtering by oxygen gas by /min shout 250 mm in speed in said zinc target upper part. After membrane formation is completed, the impression to chamber of DC magnetrum sputtering system may be countered and it can go and some back to the - to 2x10-3 Torr, [hold and] The electric power of sbout 1.0 kw/s) was impressed to the target of ntroducing argon gas and oxygen gas (100 : however, the flow rate of oxygen gas and ergon gas upper part, after washing one by one and drying with a water rinse and isopropyl slookel, Alter deacrating the inside of said tub by below abbrevistion 5x10-67 orr with a vacuum ounp next,

by /min about 800 mm in speed in said silver target upper part. The Ag libn of about 10-nm thickness layer, and a degree of vacuum is hald to abbreviation 3x10 7 forr. By inpressing the electric power of about 0.1 km(s) to said säver targat, and conveying the inside of DC magnetron sputtering by argon 9018 Noxt, setting sheet giass in said vacuum chamber, introduce argon gas 45cc in said vacuum was made into the 2nd layer on the ZnOx mombrane formation surface of said sheet glass, and membrane formation ismination was carried out. After membrane formation is completed, the a zinc target and supply of gas are suspended.

and a degree of vacuum is held to abbreviation 3×10.3 Torr, By impressing the electric power of about lomination was cerried out. After membrane formation is completed, the impression to zinc and supply 1800 mm/min in said zinc target upper part, the Zn thin film of about 6-rm thlekness was made into 90193Next. setting sheet glass in said vacuum chamber, introduce argen gas in said vacuum layer, 0.1 kw(s) to said zinc target, and conveying the inside of DC magnetron sputtering by speed about the 3rd layer on Ag membrane formation surface of said sheet glass, and membrane formation impression to a silver target and supply of gas are suspended.

for the inside of DC magnotron reactive sputtering by exygen gas by /min about 250 mm in speed in gas, (*** however, the flow rate of oxygen gas and argon gas *** 100 ; What is necessary is just to be 0020]in said vacuum layer, setting sheet gisss in said vacuum chamber Next, argon gas and oxygen ZnOx thin film of about 40-nm thickness was formed as the 4th layer by conveying said shoot glass hold and I The electric power of about 10 km(s) was impressed to the target of said zinc, and the said zinc target, upper part. After membrane formation is completed, the impression to a zinc target in the range of zero to 50:50.) --- introducing --- a degree of vacuum, --- about --- to 2x10⁻³Torr, and supply of gas are suspended.

the rate of a /sec grade about 0.15 cm, it dried about 30 minutes at about 120 3*, and the ultraviolei pulling up at about 1 orn/soc in speed, heat cure was further carried out about 30 minutes by about 140 ** after desicostion about 30 minutes by about 120 **, and about 5-micrometer hard court nature acrylic primer salution beforehand prepared on condition of the following 1 and pulling up at 0021 Next. after taking out glass with a tunic from said vacuum chamber. Ilm mesking of the field absorption film (UV) of about 8 micrometers of thickness was formed. Subsequently, after boing where a tunio is not laminated is carried out, After being immersed in the ultraviolet sbsorption immersed in the silicon system hard court solution prepared on condition of the following 2 and protective film (HC) was formed.

propylane gycol monomethy! ETERU used as a solvent are suick on an agitator and a 1000-ml round bottom flask with a reflux condenser, and 55 g of acrylic BR-85 resin (made by Mitaubishi Rayon) is ultraviolet absorption nature acrylic primer sciution for glass spreading was obtained. This utraviolet string furthermore, it applies for about 30 misutes by an oil bath, temperature up is carried out to 0023 Subsequently, after stopping warming and falling to ordinary temperature, about 100g acrylic supplied, attribg at ordinary temperature. Fluorescent brightener UVITEX-alumns (made by Göss-Geigy) 2g and ultraviolet ray absorbent TINUVIN327 (made by Ciba-Geigy) 9g are edded continuing absorption nature acrylic primer solution was transparent, and was about \$% of solid contant, and 1, altraviolet, absorption nature scrylic primer solution) 350 g of cyclohexanone and 495 g of modified siscone resin OS-808A was added, the storing dissolution was carried out, and the 0022]By the above, nultilayered film famination glass as shown in Table 1 was obtained sbout 95 **, and it holds for about 30 minutes, and is made to dissolve thoroughly.

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idoxypropyltrimetoxysilem are stuck on an agitator and a 500-mi round bottom flask with a roflux coived, then, weakly basic colloids silics solution SNOWTEX C (the product, made from the Missan ed about 20%, it reacted [shout] at about 40 ** on about the 5th, and about about 1100 number age molecular weight by GPC (the Toso make, ULCS02A) and the constituent of about 30% of denser, Add and warm 0.04 g of phthalic anhydride at about 40 👓 with a water bath, and it is micals.) The mean particle demeter of shout 15 micrometers and 100 g of SiO, content were

241145 g of isopropy' stockel was added to this, it condensed with the ultrafilter (made by Naton pore) of the cut off molecular weight 1000, and about about 1200 number average molecular ght by GPC and the constituent of about 22% of solid content were obtained. d content were obtained

0-780 rm) and solar transmittance (340-1300 nm), it is 340. It asked for the optical characteristic e type recording spectrophotometer (made by Hitachi), JISZ8722, and JISR3106, respectively. It is 23]About 0.1 part grade addition of the dicyandismide was carried out as a caring catalyst at this Ulayered film lamination glass, visible light transmittence (360-780 nm), About light reflectance stituent, and the elicone series hard costing solution was obtained. About the obtained

28]]k is what was made as [contact / this field / furthermore about the abrasion resistance by if attached to ultraviolet absorption performence. The transmissivity of 370 nm of the type ording spectrophotometer estimated.

nersed into the 1-M solution of hydrochiloric acid at ordinary temperature for about 6 hours, about in diameter 0.1 kg of load, and / a film surface], After making it go back and forth 5000 times by ged by JISR3221 and was not seen for degradation, respectively as for most O seats, and x seal } andy conspicuous after a specimen is immersed in a 1-N andium hydroxide solution at ordinary verse examination, maant what put six broaskdoth cloth 840 on $/ cm^2$ and the cylindrical bottom 5acid proof test, see and judge a membranous degradation state among chemical resistance, and ut an alkali resistant test. Degradation is [what looked at the membranous degradation state, -mn stroke, viewing estimated the state of the film surface, Next, after said specimen is

orption hest maulating glass which becomes usable as windownsanes, such as a car and a huiking, 27]Furthermore about moisture proof degree performance, visual evaluation of the surface state ar storage will be carried out to 50 **90% of environmental test in a plane for one day, two days, days, ten days, 20 days, and 30 days, and O shows that the fault of a spot etc. is not seen and was it by x seal except it. Fully being able to use it by a single plate, and having high visible light smissivity, and revealing the outstanding ultraviolet—rays cover, heat ray cover, and infrared or an that more clearly than Table 2 and drawing 1. It has the outstanding amonity, and has asion resistance, corrosion resistance, weathersbillty, and endurance, and the ultraviolet. persture for about 6 hours

n of its inickness are obtained, it carries out by the same evaluation methods with the measuring thod etc. which were shown in Example 1 in the film constitution, and the result is shown in Table)C magnetron sputtoring by argen and an ITO thin film formed the AgOu thin film so that it might 28]By the same method as two to example 3 Example 1, the multisayor film shown in Table 1 and ome predistarmined thickness to argon by DC reactivity magnetron sputtering of oxygen in very 29)The single piete article which has the obtained multilayer film was ultraviolet absorption heat expected aims at was obtained. all quantities with an ITO target.

slating glass in which each physical properties, such as an expected optical property which was ellent like Example 1, respectively, are shown.

(Yabie 2) [0031]

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JP,06-316443,A [DETAILED DESCRIPTION]

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ESE(20) by the arm where it is competite example. It cannot be an even in Table 1, methods example are action limitation on the 4th substances and interesting in the case of the 4th substances and interesting sorption. If me and self-the court protective film are not, formed. In a distance multipayored film attempt also also protected in the control of the case of

District

noss.)

Visitamination membrane formation of a SiOx film, a TiOx film, and the SiOx film was cerried out the ZiOx film after 500-rim famination by the syntheting technique on the comparative example 2.

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glass substrate. With the SIO target, the SIOx thin flan formed menturanes so that it might become the refresherment shichers for 10C nearbilly magneture aparticing by coyage in the also with a Timer is in first in first. Horrever, said

who who when the man and an experiment of court prevents he may are not forward in an analysis of an experiment of a man and a man a m

(0003)go shown in Table 2 expected does not also at the obtained residiative of firm itemisation disast section (1000) and the contraction of the

To discont presence in the (10) was end in the (10) was an end of the contraction of the

the city of the beneficial semication door, perform the primer cost make to distinct an information; the city of the beneficial semication of the city of the city

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therefore by controlling these both sides, the second accordance to the first therefore, valide light transmissionly is comparatively high and view reservation provides the fifty made ultraviolet absorption hast assubing glass which boils amenity markedly and is raised as the made ultraviolet absorption or far whiteles or a transparent heating element, an electromagnetic wave shadings boil, etc.

[Translation dane.]

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SCRIPTION OF DRAWINGS

ide Dosentytion of the Deserings!
with a property of the percent framemitance name of Example 1 of this invention, and
awing 12h is a fixture showing the spectral transmittance name of Example 1 and the comparative example 4 which we conventional examples.

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